

THE
PHILOSOPHICAL MAGAZINE

UNIVERSITY OF HAWAII LIBRARY

EDITOR
W. H. TAYLOR

LIBRARY USE ONLY

CONSULTANT EDITOR
PROFESSOR SIR NEVILL MOTT

E.P.S. EDITORIAL COMMITTEE
PROFESSOR JACQUES FRIEDEL
PROFESSOR DR. ALFRED SEEGER
PROFESSOR UGO VALDRÈ

CONSULTANTS
SIR LAWRENCE BRAGG
SIR GEORGE THOMSON

VOL. XXIII.—EIGHTH SERIES

JANUARY—JUNE 1971

LONDON:
TAYLOR & FRANCIS LTD, 10-14 MACKLIN STREET, WC2B 5NF

“Meditationis est perscrutari occulta; contemplationis est admirari perspicua.... Admiratio generat quæstionem, quæstio investigationem, investigatio inventionem.”—*Hugo de S. Victore.*

—“Cur spirent venti, cur terra dehiscat,
Cur mare turgescat, pelago cur tantus amaror,
Cur caput obscura Phœbus furrugine condât,
Quid toties diros cogat flagrare cometas,
Quid pariat nubes, veniant cur fulmina cœlo,
Quo micet igne Iris, superos quis conciat orbes
Tam vario motu.”

J. B. Pinelli ad Mazonium.



CONTENTS OF VOL. XXIII. Nos. (181-186)

(EIGHTH SERIES)

NUMBER 181—JANUARY

	PAGE
Editorial Note	1
On the Aggregation of Wadsley Defects in Slightly Reduced Rutile	
By L. A. BURSILL and B. G. HYDE	3
Far Infra-red Vibrational Spectra of Crystalline and Amorphous As_2Se_3	
By I. G. AUSTIN and E. S. GARBETT	17
Electron Spin Scattering by Alkali Metal Impurities in Liquid Sodium	
By R. A. B. DEVINE and R. DUPREE	29
The Ferromagnetic Phase in Silmanal	
By L. M. CASTELLIZ and H. A. KAZI	43
Poole-Frenkel Conduction in Amorphous Solids	
By ROBERT M. HILL	59
Maximizing the Penetration in High Voltage Electron Microscopy	
By C. J. HUMPHREYS, L. E. THOMAS, J. S. LALLY and R. M. FISHER... ..	87
The Treatment of Errors in the Deconvolution of Line Profile Measurements	
By RUSSELL CHENG, BRIAN WILLIAMS and MALCOLM COOPER	115
The Growth of Voids in Nickel in a High-voltage Electron Microscope	
By D. I. R. NORRIS	135
Experiments on the Contact Angle of Water on Ice	
By CHARLES A. KNIGHT	153
On Values of Activation Energy for Migration of Single Vacancies in Metals	
By K. A. OSIPOV	167
The Hall Effect in Tin	
By R. C. BARKLIE	175
The X-ray Debye Temperatures of V, Ni, Cu, Nb and Ag from the Measured Integrated Intensities at 300 K and 4 K	
By M. V. LINKOHO	191
A Theoretical Study of the Energies of Formation of Point Defects in CaF_2 and UO_2	
By K. THARMALINGAM	199
Photo-currents in Silicon Monoxide Films	
By A. K. JONSCHER and A. A. ANSARI	205
Correspondence:	
The Obstacle Radius of a Pile-up of Edge Dislocations	
By P. M. HAZZLEDINE	225
Microdeformation of Diamond in the Electron Microscope	
By N. GANE and J. M. COX	229
Stress and Velocity Field Produced by Uniformly Moving Dislocations in Anisotropic Media	
By T. MURA	235
Ferrofluids Containing Ni-Fe Alloy Particles	
By P. G. SHEPHERD and J. POPPLEWELL	239
On the Influence of Plastic Strain on Magnetomechanical Damping in Iron and Nickel	
By J. T. A. ROBERTS	243

NUMBER 182—FEBRUARY

	PAGE
Editorial Note	
Defect Formation and Sputtering of Alkali Halides with Low Energy Irradiation	
By D. J. ELLIOTT and P. D. TOWNSEND	249
Polygonization of KI Surfaces by Photon Irradiation	
By D. J. ELLIOTT and P. D. TOWNSEND	261
Grain-boundary Sliding and Diffusion Creep in Polycrystalline Solids	
By R. N. STEVENS	265
Work-hardening Theory of Fibre-reinforced Composites	
By P. NEUMANN and P. HAASEN	285
'Bright Spot' Images in Field Ion Micrographs of Irradiated Tungsten	
By J. T. BUSWELL	293
Dislocation Structure and the Effect of Stacking-fault Energy in High Temperature Creep of Cu-Al Solid Solutions	
By A. ORLOVÁ, M. PAHUTOVÁ and J. ČADEK	303
Dispersed Paramagnetic Nitrogen Content of Large Laboratory Diamonds	
By R. M. CHRENKO, H. M. STRONG and R. E. TUFT	313
Quench-hardening of Aluminium and Aluminium-Magnesium by Sub-microscopic Defects	
By D. HARDIE and A. D. MICHAEL	319
Magnetic Hardness of the Intermetallic Compound SmCo_5 as a Function of Particle Size	
By R. A. MCCURRIE and G. P. CARSWELL	333
Härtung von Supraleitern durch Versetzungen	
VON HERBERT C. FREYHARDT	345
Härtung von Supraleitern durch Ausscheidungen	
VON HERBERT C. FREYHARDT	369
Theoretical Magnitude of Relaxation Creep in a Material Subjected to a Finite Total Strain Rate	
By J. H. GITTUS	393
Cation Self-diffusion in Single Crystal MgO	
By B. C. HARDING, D. M. PRICE and A. J. MORTLOCK	399
Neutron Irradiation Damage in Molybdenum. Part I. Characterization of Small Perfect Dislocation Loops by Transmission Electron Microscopy	
By D. M. MAHER and B. L. EYRE	409
Neutron Irradiation Damage in Molybdenum. Part II. The Influence of Crystal Perfection and Irradiation Temperature on the Damage Structure and its Annealing Behaviour	
By B. L. EYRE, D. M. MAHER and A. F. BARTLETT	439
Grain Boundary Dislocations: their Effect on Vacancies and Sliding	
By D. MCLEAN	467
Electron Microscope Observations of Stacking Faults and Microtwins in Synthetic Diamond	
By G. S. WOODS	473
Analysis of the Size Distribution Interstitial Clusters in Irradiated Crystals	
By J. J. BURTON	485
The Formation of Helium Gas Bubbles in Neutron-irradiated Copper-Boron Alloys	
By D. E. BARRY	495
Correspondence:	
Low Temperature Magnetic Hysteresis of Fine Particle Aggregates occurring in some Natural Samples	
By C. RADHAKRISHNAMURTY, S. D. LIKHITE and N. P. SASTRY	503

NUMBER 183—MARCH

	PAGE
High Temperature Creep in Copper	
By M. PAHUTOVÁ, J. ČADEK and P. RYŠ	509
On the Frequency Dependence of Conductivity in Amorphous Solids	
By M. POLLAK	519
The Formation of Stacking Faults in Magnesium–Thorium Alloys	
By B. NOBLE, T. J. PIKE and A. CROOK	543
Isotope Effects and Defect Energetics for Diffusion in Na and NaCl	
By R. C. BROWN, J. WORSTER, N. H. MARCH, R. C. PERRIN and R. BULLOUGH	555
Phonon Scattering of Fast Electrons by Crystals	
By J. J. EARNEY	577
Lang Topography of Dislocations in Cadmium	
By A. S. T. BADRICK and K. E. PUTTICK	585
A Rationalization of Secondary Defect Structures in Aluminium-based Alloys	
By K. H. WESTMACOTT and R. L. PECK	611
Pressure and Strain Rate Dependence of Dynamic Recovery in NaCl	
By LANCE A. DAVIS	623
Dislocation Climb Sources and Vacancy Loops in Quenched Al-2.5% Cu	
By J. D. BOYD and J. W. EDINGTON	633
Crystallite Size and Shape Relationships in the Product-Precursor Pair MgO–Mg(OH)₂	
By I. F. GUILLIATT and N. H. BRETT	647
Pressure and Temperature Dependence of the Low Frequency Relative Permittivity of the Alkali Halides	
By K. RAJI MAHMUD, K. V. KAMATH and B. K. P. SCAIFE	655
Localized Conduction Processes in Amorphous Germanium	
By M. MORGAN and P. A. WALLEY	661
Structure and Conductivity Mechanisms in some Liquid Semiconductors	
By R. J. HODGKINSON	673
Fatigue Failure in High Strength Metals	
By B. TOMKINS	687
Charge and Spin Density Distributions in the Ferromagnetic Alloy Fe₂B	
By P. J. BROWN and J. L. COX	705
Correspondence:	
On Analysing Burgers Vectors of Dislocations Residing in a Coherent Twin Boundary	
By D. E. BARRY and S. MAHAJAN	727
Influence of Hydrostatic Pressure of the Flow Stress in Polycrystalline NaCl	
By R. A. EVANS, B. A. W. REDFERN and A. S. WRONSKI	731
The Hardening Rate of Fibre-strengthened Materials	
By K. TANAKA and T. MORI	737
Order-strengthening in CuAu	
By E. W. HORNE and E. A. STARKE, Jr.	741

NUMBER 184—APRIL

Study of Electron Shadow Patterns of the Intermediate State of Super- conducting Lead	
By G. POZZI and U. VALDRÈ	745
The Application of Electron Energy Loss Analysis to Microanalysis	
By R. A. CRICK and D. L. MISELL	763

A General Dislocation Model for High-temperature Creep	
By G. B. GIBBS	771
Twin-Slip and Twin-Twin Interactions in Mo-35 at. % Re Alloy	
By S. MAHAJAN	781
The Formation and Elimination of Helical Dislocations in Semiconductors	
By M. S. ABRAHAM, J. BLANC and C. J. BUIOCCHI	795
High-angle Twist in GaSe	
By E. MOOSER and M. SCHLÜTER	811
Dislocation Structures in Deformed Iron Single Crystals	
By A. S. KEH, W. A. SPITZIG and Y. NAKADA	829
The Effect of Diffusivity Gradients on Diffusion to Dislocations	
By H. K. BIRNBAUM, B. L. EYRE and W. DROTNING	847
Effect of Temperature, Strain Rate and Impurity Content on the Work-hardening Characteristics of LiF Single Crystals	
By H. L. FOTEDAR and T. G. STOEBE	859
Elektronenmikroskopische Untersuchung der Versetzungsanordnung verformter Kupfereinkristalle im belasteten Zustand. I. Die Versetzungsanordnung am Ende von Bereich I	
By H. MUGHRABI	869
Elektronenmikroskopische Untersuchung der Versetzungsanordnung verformter Kupfereinkristalle im belasteten Zustand. II. Die Versetzungsanordnung im Bereich II	
By H. MUGHRABI	897
Elektronenmikroskopische Untersuchung der Versetzungsanordnung verformter Kupfereinkristalle im belasteten Zustand. III. Vergleich einiger Kenngrößen der Versetzungsstruktur im belasteten und im entlasteten Zustand	
By H. MUGHRABI	931
Effect of Grain Size on Serrated Yielding in an Al-Mg-Si Alloy	
By P. G. MCCORMICK	949
The Initial Stages of the Omega Phase Transformation in Ti-V Alloys	
By K. K. MCCABE and S. L. SASS	957
Correspondence:	
Intergranular Fracture in Low Carbon Iron	
By E. A. ALMOND, D. H. TIMBRES and J. D. EMBURY	971

NUMBER 185—MAY

Pseudopotentials and Residual Resistivities in Silver and Gold	
By A. MEYER, W. H. YOUNG and TERENCE M. HAYES	977
On the Formation of Gas Bubbles in Fissile Material during Reactor Irradiation	
By A. D. WHAPHAM	987
Deformation Substructures and Terminal Properties of Explosively-loaded Thin-walled Stainless-steel Cylinders	
By L. E. MURR, J. V. FOLTZ and F. D. ALTMAN	1011
Flux-flow Noise in Magnetically Coupled Superconductors. Observation of a $1/f$ Spectrum	
By J. M. A. WADE	1029
The Influence of a Concentration Gradient on the Free Energy of a Binary Solution	
By J. W. MORRIS, Jr.	1041
Effect of Oxygen Impurity on the Electrical Conductivity and Dielectric Properties of CoO and NiO Single Crystals	
By K. V. RAO and K. SURYANARAYANA RAO	1053

	PAGE
Low-temperature Resistivity in nearly Excitonic Systems By D. JEROME, M. RIEUX and J. FRIEDEL	1061
Electrical and Electron Microscope Studies of the Annealing of Tellurium-doped Gallium Arsenide By D. LAISTER and G. M. JENKINS	1077
The Growth of Creep Cavities by Grain Boundary Sliding By H. E. EVANS	1101
The Temperature Dependence of the Peak Effect in a Type II Superconductor By K. E. OSBORNE	1113
Fracture of Polymethylmethacrylate at Low Temperatures By P. BEARDMORE and T. L. JOHNSTON	1119
Radial Correlation Functions of Metallic Melts Calculated from Structural Models of the Liquid State By I. A. KOTZÉ and D. KUHLMANN-WILSDORF	1133
The Effect of Temperature on the Effective Fracture Surface Energy of Metals and Alloys By J. A. WILLIAMS and I. G. PALMER	1155
Electronic Transport Properties of Liquid Mercury-Sodium Alloys By H. A. DAVIES, J. S. LLEWELYN LEACH and P. H. DRAPER	1163
The Fatigue Hardening and Softening of Copper Containing Silica Particles By W. M. STOBBS, D. F. WATT and L. M. BROWN	1169
The Work-hardening of Copper-Silica. I. A Model Based on Internal Stresses, with no Plastic Relaxation By L. M. BROWN and W. M. STOBBS	1185
The Work-hardening of Copper-Silica. II. The Role of Plastic Relaxation By L. M. BROWN and W. M. STOBBS	1201
Correspondence:	
Some Electron Microscope Observations of Twinning in Indium By CUPPAM DASARATHY	1235
Photochromism in Copper-doped Niobium Pentoxide By W. CLARK and R. STROUD	1237
Magneto-Seebeck Effect in Graphite: Giant Thermoelectric Power due to Phonon Drag By T. TAKEZAWA, T. TSUZUKU, A. ONO and Y. HISHIYAMA	1241
On the Phase Change in Zinc Sulphide Crystals By M. DUBEY, B. P. PANDEY and G. SINGH	1245

NUMBER 186—JUNE

Magnetic Properties of Liquid Alloys of Tellurium and Thallium By D. BROWN, D. S. MOORE and E. F. W. SEYMOUR	1249
Mechanical Effects in Flux Motion By P. C. WRAIGHT	1261
Strain, Recovery and Work-hardening during Creep due to Dislocations By J. H. GITTUS	1281
Metal-Insulator Transition in NiS₂ By J. A. WILSON and G. D. PITT	1297
Slip Systems in NiAl Single Crystals at 300°K and 77°K By M. H. LORETTO and R. J. WASILEWSKI	1311
Incorporation of Correction Terms into the Self-consistent Calculation of Screening in Metals By MD. M. ISLAM and M. A. BALL	1329

	PAGE
A Contribution to the Theory of Dislocation Climb	
By W. D. NIX, R. GASCA-NERI and J. P. HIRTH	1339
A Portevin-Le Chatelier Effect expected from Solute Atmosphere Dragging	
By H. YOSHINAGA and S. MOROZUMI	1351
The Solute Atmosphere Round a Moving Dislocation and its Dragging Stress	
By H. YOSHINAGA and S. MOROZUMI	1367
The Portevin-Le Chatelier Effect in Vanadium	
By H. YOSHINAGA, K. TOMA, K. ABE and S. MOROZUMI	1387
Fracture and the Formation of Misfit Dislocations between PbS and PbSe	
By J. W. MATTHEWS	1405
The Lattice Vibrations of the MoS₂ Structure	
By R. A. BROMLEY	1417
On the Heating of a Field Ion Microscope Specimen	1429
By D. N. SEIDMAN and R. M. SCANLAN	1429
An <i>In-situ</i> Field Ion Microscope Study of Irradiated Tungsten. I. Experimental Results	
By R. M. SCANLAN, D. L. STYRIS and D. N. SEIDMAN	1439
An <i>In-situ</i> Field Ion Microscope Study of Irradiated Tungsten. II. Analysis and Interpretation	
By R. M. SCANLAN, D. L. STYRIS and D. N. SEIDMAN	1459
The Diffusion of Manganese in Aluminium	
By G. M. HOOD and R. J. SCHULTZ	1479
Plastic Deformation of Benzoic Acid Crystals	
By P. HANCOCK, D. R. TEDSTONE and J. N. SHERWOOD	1491
New Crystallographic Shear Families Derived from the Rutile Structure, and the Possibility of Continuous Ordered Solid Solution	
By L. A. BURSILL, B. G. HYDE and D. K. PHILP	1501
A Study of High Temperature Creep in LiF Single Crystals	
By W. A. COGHLAN, R. A. MENEZES and W. D. NIX	1515
The Effect of Interstitial Solutes on the Twinning Stress of B.C.C. Metals	
By C. L. MAGEE, D. W. HOFFMAN and R. G. DAVIES	1531
A Re-interpretation of the 'Coincidence Model' for Grain Boundaries	
By B. CHALMERS and H. GLEITER	1541
Correspondence:	
On Dislocation Climb Rate	
By G. EDELIN	1547
Dynamic Work-hardening of an Fe-Mn Alloy	
By A. CHRISTOU and J. V. FOLTZ	1551
Channelling Effects in High-resolution Scanning Electron Microscopy	
By A. HOWIE, P. F. LININGTON and P. N. TOMLINSON	1559
Subject Index	1567
Index of Authors (with Titles)	1573
List of Contents	iii